WHAT IS CLAIMED IS:

1. A vertical cavity surface emitting laser, comprising:

a substrate;

a first mirror stack over the substrate;

an active region having a plurality of quantum wells over the first mirror stack;

a tunnel junction over the active region, the tunnel junction including a modulation doped layer; and

a second mirror stack over the tunnel junction.

2. A vertical cavity surface emitting laser according to claim 1, wherein the modulation layer is doped with a concentration greater than 1×10^{19} cm^{-3}.

3. A vertical cavity surface emitting laser according to claim 1, wherein the modulation doped layer further includes a first layer and a second layer, the first layer being a highly dopable material or a dopant layer.

4. A vertical cavity surface emitting laser according to claim 3, wherein a total thickness of the first layer and the second layer is in a range of about 0.1nm ~ about 2nm.

5. A vertical cavity surface emitting laser according to claim 1, a p-layer of the tunnel junction includes the modulation doped layer.

6. A vertical cavity surface emitting laser according to claim 5, wherein an n-layer of the tunnel junction further includes an n-layer of a compound selected from the group consisting of InP, AlInAs, AlInGaAs, InGaAsP, GaAs, AlAs, AlGaAs, InGaAs, AlGaAsSb, GaAsSb, AlAsSb, AlPSb, GaPSb, AlGaPSb, and combinations thereof.

7. A vertical cavity surface emitting laser according to claim 6, wherein the modulation doped layer is an AlInAs layer epitaxially grown as a digital alloy of p-type doped AlAs and InAs.

8. A vertical cavity surface emitting laser according to claim 7, wherein the p-type AlAs layer is doped with carbon to a concentration greater than $1x10^{19}$ cm^{-3}, and wherein an effective doping concentration of the modulation doped layer is greater than $1x10^{19}$ cm^{-3}.

9. A vertical cavity surface emitting laser according to claim 1, an n-layer of the tunnel junction includes the modulation doped layer.

10. A vertical cavity surface emitting laser according to claim 9, wherein a p-layer of the tunnel junction further includes a p-layer of a compound selected from the group consisting of InP, AlInAs, AlInGaAs, InGaAsP, GaAs, AlAs, AlGaAs, InGaAs, AlGaAsSb, GaAsSb, AlAsSb, AlPSb, GaPSb, AlGaPSb, and combinations thereof.

11. A vertical cavity surface emitting laser according to claim 10, wherein the modulation doped layer includes a SiAs layer and an AlGaInAs layer.

12. A vertical cavity surface emitting laser according to claim 11, wherein the AlGaInAs layer is n-type or non-intentionally doped.

13. A vertical cavity surface emitting laser according to claim 11, wherein the thickness of the SiAs layer is about 1/1000 of the AlGaInAs layer.

14. A vertical cavity surface emitting laser according to claim 11, wherein an effective doping concentration of the modulation doped layer is greater than $1x10^{19}$ cm^{-3}.

15. A vertical cavity surface emitting laser according to claim 1, further including an n-type spacer adjacent the active region, and wherein the first mirror stack is an n-type DBR.

16. A vertical cavity surface emitting laser according to claim 1, further including an p-type spacer adjacent the tunnel junction, and wherein the second mirror stack is an n-type DBR.

17. A vertical cavity surface emitting laser according to claim 1, further including:

an n-type bottom spacer adjacent the active region, and wherein the first mirror stack is an n-type DBR; and

an p-type top spacer adjacent the tunnel junction,

wherein the first and second mirror stacks are each an n-type DBR.

18. A vertical cavity surface emitting laser according to claim 5, wherein the p-layer is doped with carbon with a concentration greater than $1x10^{19}$ cm^{-3}.

19. A vertical cavity surface emitting laser according to claim 1, wherein the active region includes one of InGaAsP and AlInGaAs.

20. A vertical cavity surface emitting laser according to claim 1, wherein the first and second mirror stacks are lower and upper mirror stacks, respectively.

21. A vertical cavity surface emitting laser according to claim 1, wherein the modulation layer is used for both a p-layer and an n-layer of the tunnel junction.

22. A vertical cavity surface emitting laser according to claim 21, wherein the n-layer includes a SiAs layer and an AlGaInAs layer, and wherein the p-layer is an AlInAs layer epitaxially grown as a digital alloy of p-type doped AlAs and InAs.

23. A tunnel junction including a modulation doped layer.

24. A tunnel junction according to claim 23, wherein the modulation-doped layer is doped with an effective carrier concentration greater than $1x10^{19}$ cm^{-3}.

25. A tunnel junction according to claim 23, wherein the modulation doped layer further includes a first layer and a second layer, the first layer being a highly dopable material or a dopant layer.

26. A tunnel junction according to claim 25, wherein a total thickness of the first layer and the second layer is in a range of about 0.1nm ~ about 2nm.

27. A tunnel junction according to claim 23, a p-layer of the tunnel junction includes the modulation doped layer.

28. A tunnel junction according to claim 27, wherein an n-layer of the tunnel junction further includes an n-layer of a compound selected from the group consisting of InP, AlInAs, AlInGaAs, InGaAsP, GaAs, AlAs, AlGaAs, InGaAs, AlGaAsSb, GaAsSb, AlAsSb, AlPSb, GaPSb, AlGaPSb, and combinations thereof.

29. A tunnel junction according to claim 23, wherein the modulation doped layer is an AlInAs layer epitaxially grown as a digital alloy of p-type doped AlAs and InAs.

30. A tunnel junction according to claim 29, wherein the p-type AlAs layer is doped with carbon to a concentration greater than $1x10^{19}$ cm^{-3}, and wherein an effective doping concentration of the modulation doped layer is greater than $1x10^{19}$ cm^{-3}.

31. A tunnel junction according to claim 23, an n-layer of the tunnel junction includes the modulation doped layer.

32. A tunnel junction according to claim 31, wherein a p-layer of the tunnel junction further includes a p-layer of a compound selected from the group consisting of InP,

AlInAs, AlInGaAs, InGaAsP, GaAs, AlAs, AlGaAs, InGaAs, AlGaAsSb, GaAsSb, AlAsSb, AlPSb, GaPSb, AlGaPSb, and combinations thereof.

33. A tunnel junction according to claim 32, wherein the modulation doped layer includes a SiAs layer and an AlGaInAs layer.

34. A tunnel junction according to claim 33, wherein the AlGaInAs layer is n-type or non-intentionally doped.

35. A tunnel junction according to claim 33, wherein the thickness of the SiAs layer is about 1/1000 of the AlGaInAs layer.

36. A tunnel junction according to claim 33, wherein an effective doping concentration of the modulation doped layer is greater than 1×10^{19} cm^{-3}.

37. A long wavelength VCSEL, comprising:

an indium-based semiconductor alloy substrate;

a first mirror stack over the substrate;

an active region having a plurality of quantum wells over the first mirror stack;

a tunnel junction over the active region, the tunnel junction including a modulation doped layer; and

a second mirror stack over the tunnel junction.

38. A long wavelength VCSEL according to claim 37, wherein the modulation layer is doped with a concentration greater than $1 \times 10^{19}\ cm^{-3}$.

39. A long wavelength VCSEL according to claim 37, wherein the modulation doped layer further includes a first layer and a second layer, the first layer being a highly dopable material or a dopant layer.

40. A long wavelength VCSEL according to claim 39, wherein a total thickness of the first layer and the second layer is in a range of about 0.1nm ~ about 2nm.